

Claims

(54)

1. A process for the production of hydrocarbons by the Fischer-Tropsch reaction comprising
 - a) subjecting a mixture of a gaseous hydrocarbon feedstock and steam to steam reforming by:
 - i. passing the mixture over a catalyst disposed in heated tubes in a heat exchange reformer,
 - ii. subjecting the resultant primary reformed gas to secondary reforming by partially combusting the primary reformed gas with oxygen provided by an oxygen-rich gas comprising >90% oxygen and bringing the resultant partially combusted gas towards equilibrium over a secondary reforming catalyst, and
 - iii. using the resultant secondary reformed gas to heat the tubes of the heat exchange reformer, thereby producing a partially cooled reformed gas,
 - b) further cooling the partially cooled reformed gas to below the dew point of the steam therein to condense water and separating condensed water to give a de-watered synthesis gas,
 - c) passing said de-watered synthesis gas through a hydrocarbon synthesis reaction to form a reaction products stream,
 - d) separating at least a part of said reaction products stream into a hydrocarbons product stream and a tail gas stream,
 - e) combusting at least a part of said tail gas to produce a combustion gas, and
 - f) using said combustion gas to drive a turbine, thereby to produce power from said turbine.
2. A process as claimed in claim 1, wherein said oxygen rich gas is provided by an air separation unit and wherein nitrogen generated by said air separation unit is fed to said turbine.
3. A process as claimed in claim 1 or claim 2, wherein said turbine is a part of an integrated gas turbine apparatus comprising an air compressor for supplying compressed air for use in said gas turbine apparatus, a combustion chamber and said turbine.
4. A process as claimed in claim 3, wherein a portion of the compressed air is supplied to said air separation unit.
5. A process as claimed in any of the preceding claims wherein the exhaust gases from the gas turbine are passed through a heat exchanger to recover heat for use in the process.

6. A chemical plant apparatus for producing a liquid hydrocarbon product from a hydrocarbon feedstock and steam comprising:
 - a) a heat exchange primary reformer which comprises a shell, a plurality of reaction tubes disposed within said shell and containing a reforming catalyst, and means for flowing a heat transfer medium within said shell to heat said reaction tubes,
 - b) a secondary reformer comprising an upstream combustion region and a downstream reforming region comprising a bed of a reforming catalyst, and means to introduce an oxygen-rich gas comprising >90% oxygen and a primary reformed gas into said combustion region,
 - c) means to transfer a secondary reformed gas from said secondary reformer into the shell of said primary reformer
 - d) means for transferring said secondary reformed gas from said primary reformer shell via dewatering means to a hydrocarbon synthesis reactor
 - e) a hydrocarbon synthesis reactor
 - f) means for separating a synthesised hydrocarbon stream produced in said hydrocarbon synthesis reactor into a liquid hydrocarbon product stream and a tail gas stream
 - g) gas turbine apparatus comprising an air compressor, a combustion chamber and a turbine unit
 - h) means for transferring at least a portion of said tail gas to the combustion chamber of said gas turbine.
7. An apparatus as claimed in claim 6, further comprising an air separation unit for separating air into an oxygen-rich gas for supply to said secondary reformer and a nitrogen-containing gas.
8. An apparatus as claimed in claim 7, further comprising means to introduce said nitrogen-containing gas into said gas turbine apparatus.
9. An apparatus as claimed in claim 7 or claim 8, further comprising means to introduce compressed air generated by said air compressor into said gas turbine apparatus.